notably during the last two thousand years. In the days of the Teutonic barbarians both the reindeer and the elk, he says, roamed in the forests of Germany and Poland. To-day the reindeer can not subsist in regions so far south. At the same remote period, according to Gibbon, our barbarian ancestors crost the Rhine and the Rhone upon bridges of ice, altho in modern times these rivers never freeze sufficiently to allow of this. On the other hand Eginitis,[18] in the annales of the Observatory of Athens, sets forth various reasons for believing that there has been no change. He bases his arguments chiefly upon botanical evidence such as the kind of crops grown in certain regions, dates of flowering, time of harvest, and so forth. The great variability of plants, and the degree to which they are affected by cultivation, and the ease with which they accommodate themselves to a new environment renders any conclusions drawn from vegetation uncertain unless supported by other evidence. The same is doubtless true of animals. If Gibbon is right about the ice, however, the climate of Europe must have suffered a change similar to that which seems to have taken place in Asia.

The geographical location of the evidences of changes of climate is a subject in regard to which there is much misconception. In his recent excellent work entitled "Climate," Ward,[19] who opposes the idea of any important climatic changes during historic times, expresses himself thus: "It is a very striking fact that the districts from which comes most of the evidence of changes of climate within historical times are subtropical or subequatorial, i. e., they are in just those latitudes in which a slightly greater or a slightly less migration of the rain-bringing conditions easily produces a very considerable increase or decrease in the annual rainfall." Such an assertion is true for Africa, to which Ward has chiefly confined his attention. It is by no means true for Asia. Of the eight basins discust above, none is subequatorial. One, that of Seyistan in latitude 30° N. is distinctly subtropical, and Gyul-jük, 38° N., lies on the edge of subtropical regions. Kashmir, in latitude 34° N., may also be regarded as subtropical, altho its position north of the first great range of the Himalayas subjects it to conditions different from those of ordinary regions in the subtropical zone. Pangong (in western Thibet) lies in the same latitude as Kashmir, but its location beyond or northeast of the whole body of the Himalayas gives its climate little resemblance to that of other subtropical countries. The rest of the basins lie well beyond the limits of what are usually called subtropical regions. The huge basin of Lop extends from latitude 36° N. to 43° N. Turfan lies entirely between 42° N. and 44° N., and Son Kul likewise. The limits of the Caspian basin extended from 35° N. to 60° N. The northern parts of this basin may fairly be omitted from consideration, but Russian observers have recorded a good deal of evidence which indicates that numerous small lakes in latitude 45° N. to 50° N., northeast of the Caspian, are, on the whole, decreasing in size, altho they fluctuate more or less. The same is true of Lake Balkash farther east in latitude 45° N. These regions, like Son Kul and Turfan and much of the Lop basin, receive summer rains, and have a climate of a distinctly temperate continental type. The fact seems to be that evidences of changes of climate have been reported in large numbers from subtropical regions, not merely because those regions are on the borders of diverse climatic zones, but also because they are dry enough to be sensibly affected by changes of climate which are not noticeable in moister parts of the world. The evidence of change seems to be found in all dry regions wherever they are located. It would be rash to conclude that climate has not changed even in Europe. In that continent a moderate change in either direction would produce few results which could be recognized after a lapse of hundreds of years except in countries such as Spain and Greece which are at present suffering from aridity, or in countries such as northern Russia which would be greatly influenced by a decrease in the length of summer.

[*To be continued.*]

[18] See a fuller summary of Eginitis' work in the Monthly Weather Review, December, 1898, 26:554.—*C. A.*

[19] R. DeC. Ward: Climate. New York. 1908. p. 351.

NOTES ON THE CLIMATE OF EASTERN ASIA.

By Prof. ALFRED J. HENRY. Dated Washington, D. C., July 24, 1907.

In point of magnitude and diversity of physical features, the Continent of Asia stands preeminent among the grand divisions of the earth. Its greatest length is about 7,000 miles, and its width from Northeast Cape to the southern extremity of the Malay Peninsula is about 5,300 miles. It contains the greatest unbroken land mass on the globe, and its eastern shore is washt by an equally great water surface, thus affording an opportunity for the creation of two highly developed climates of directly opposite types.

Each of these great surfaces, the land and the water, has its own distinctive atmosphere each of which differs from the other in point of temperature, density, and moisture. These differences arise chiefly because water, on account of its high specific heat, warms more slowly and to a less degree than land. Likewise the loss of heat by radiation is much smaller from a water than from a land surface. As a consequence of the operation of those two processes, the atmosphere overlying the great plains of Asia becomes very much warmer in summer and decidedly colder in winter than that which overlies the oceans to the east and south. When the continent becomes warmer than the ocean, there is an inflow of air from the sea toward the interior, and conversely, when the temperature of the interior falls below that of the adjacent oceans, the flow is from the interior outward toward the oceans.

In winter, the continental influence is the dominating factor. As the sun recedes from northern latitudes, intense radiation of heat from the vast Siberian plains sets in and soon the amount of heat thus lost exceeds the amount received. The lower layers of the atmosphere are also cooled by contact with the frozen ground and doubtless by the slow descent of the cold air from aloft. There is thus gradually built up over these Siberian plains a semipermanent area of cold air of such proportions that it almost completely dominates the weather of eastern and central Asia. This mass of cold air, or the Siberian high, as it is commonly called, is the seat of the greatest known cold on the globe; cold north winds proceed out of it and sweep to the southward over Manchuria, Mongolia, Corea, and northern China.

It is important to note in this connection that, by reason of the modifying influence of the rotation of the earth on its axis, a body set in motion in the Northern Hemisphere is constantly deflected to the right, hence, the northerly winds which issue from the Siberian high become northeast some distance south of their origin as on the central and northern Chinese coast, and become east winds still farther south in the vicinity of Hongkong. The north and northwest winds in coming from a cold interior are dry winds, hence, there is very little precipitation in Siberia, Manchuria, Korea, and northern China in the cold season.

In summer, the oceanic influence is the controlling factor. As the meridian altitude of the sun increases, the cold air of the interior is gradually replaced by warm and consequently light air. The balance of pressure is then shifted from the interior to the surrounding oceans, hence a change in the winds, viz, from a northerly to a southerly quarter. Northerly winds are cold and dry; southerly warm and moist. The rainfall of eastern Asia comes with southerly winds.

The above brief sketch presents the broad features of the general circulation of the atmosphere in its relation to climate.

The local circulations, the topographic influences, and other details can not be touched upon for lack of definite information.

The observations available.—The observations for the Empire of Japan are abundant and of excellent quality, altho the period of years is not so great as could be desired. An excellent summary of the climatology of Japan was issued in 1893 by the Central Meteorological Society of Japan. See The Climate of Japan, by K. Nakamura, Tokyo, 1893. Most of the observations in this volume were made at or near sea-level, and the number of years of record ranges from two to nineteen, the average being close to ten years. This volume should be consulted in case information in greater detail than is here given is desired.

The results of climatological observations in Siberia, Manchuria, northern Mongolia, and northeastern China were taken mostly from the publications of the Central Physical Observatory and the Imperial Academy of Sciences of St. Petersburg, Russia.

The publications of the Hongkong Observatory, under the direction of Dr. W. Doberck, and the Zi-ka-wei Observatory, near Shanghai, under the direction of the order of the Jesuits, were freely consulted.

Two special publications—one a monograph on the climate of Peking by Dr. H. Fritsche, Repertorium für Meteorologie, No. 8, Petersburg, 1876; the other a report on the climate of eastern Asia by the same author—were also found very useful.

The Imperial Chinese Maritime Customs has maintained meteorological observations at points along the Chinese coast and in the Yangtze River Valley for the last thirty-odd years. Unfortunately the observers, in the beginning, were without skill and experience in making meteorological observations, the published results appeared only at widely separated intervals, and frequently in a form so different from that of the preceding publication that it was impossible to compile much trustworthy data from them. Doctor Doberck, the director of the Hongkong Observatory, has exprest the opinion, in which the writer shares, that the results for temperature, especially in the Yangtze Valley, are too high in summer, in individual cases as much as 6°. There is no means available to the writer of intelligently applying a correction; accordingly, he gives them as recorded, with the injunction to use them conservatively. The observations at the customs stations in later years were made by instruments of approved construction and verified at the Hongkong Observatory. The thermometers were exposed in Stephenson screens. (Quarterly Journal, Roy. Met. Soc., vol. XIV, p. 217.)

The geographic coordinates and the information concerning the observing stations at Urga, Ho K'ien, and Tai Yuen-Fu follow:

Urga, latitude 47° 54′ N., longitude 106° 57′ E., the chief town of Mongolia, is situated at the confluence of the rivers Tola and Selba about 180 miles south of the Russian frontier town of Troitskosavsk. It is in a great valley, 18 to 20 miles long from east to west, and 4 to 8 miles broad from north to south. The surrounding country, while not a pure desert, should be classed with the Siberian steppes. The observations were compiled from Russian sources.

Ho K'ien (Ho Kiu), latitude 32° 22′ N., longitude 116° 15′ E. is in the province of Ngan-Hwei, China. The records were obtained thru the observatory of Zi-ka-wei and were summarized in the Meteorologische Zeitschrift.

Tai Yuen-Fu, latitude 37° 55′ N., longitude 112° 12′ E. lies to the southwest of Peking in the province of Shan-Si. The records appeared in Symons's Meteorological Magazine.

THE CLIMATE OF JAPAN.[1]

The Empire of Japan is composed of a chain of islands stretching from Formosa northeasterly to the southern extremity of the Kamchatkan Peninsula. The principal islands are five in number, viz, Formosa, Kiushiu, Hondo (Nonshu), and Yezzo (Hokkaido.)

This discussion does not apply to Formosa and the smaller islands of the Empire.

The northern portion of Yezzo is situated in about 45° N. latitude, or that corresponding to the parallel which passes thru the central portion of Maine; Alpena, Mich.; St. Paul, Minn.; and a few miles south of Portland, Oreg. The southern extremity of Kiushiu corresponds in latitude to the southern portion of Georgia, south-central Texas, and northern Mexico west of the one hundred and sixth meridian west of Greenwich. The portion of Japan above enumerated is separated from the Continent of Asia by the Sea of Japan and connecting channels. The islands are quite mountainous, tho no specially high altitudes are reached. It is important to note, however, that the mountains form the backbone of the islands, so to speak, and divide the drainage into two slopes, one facing the Pacific and the other facing the Sea of Japan.

Precipitations.—Notwithstanding the insular position of Japan, its climate is strongly influenced by the Continent of Asia, from which it is separated by the Sea of Japan only. In the cold season, November to April, continental winds blow across the empire from the cold interior of eastern Siberia and lower the temperature below the mean for the season and latitude. The northwest winds, in passing over the Sea of Japan, absorb a generous amount of moisture which is condensed on the mountains and western slopes of Japan, producing cloudy weather with considerable snow. On the Pacific slopes, the weather of winter is decidedly pleasant with many successive days of agreeable weather. In summer the wind system is reversed, and the prevailing direction is then southeast, producing on the Pacific slopes much cloud and rain, especially for about thirty days from the middle of June. The amount of precipitation in Japan diminishes roughly from south to north, but, owing to the configuration of the country, there are many exceptions to this rule. In general, it is heavier on the coast than inland. The mean annual amount varies from 600 mm. (23.62 inches) on the northeast coast of Yezzo to 3,100 mm. (122 inches) at Shingu in the province of Kii (southeast coast of Hondo). In general, the empire receives an abundance of precipitation, more than is considered essential to the needs of agriculture.

Temperature.

Ocean currents.—In the cold season the dominating control of temperature lies in the continental winds that sweep from the northwest to the southeast; less effective controls lie in the ocean currents which wash the shores of the various parts of the Empire. The best known of these, the Kuroshiwo, a warm current, first appears on the eastern side of Luzon and Formosa and flows thence northerly, dividing into two currents south of the Riu Kiu (Liu Kiu) Islands. The main current then turns to the northeast and passes off the southern coast of Kiushiu, Shikoku, and Honshu, bearing to those provinces the same relative position that the Gulf Stream does to New England. Since the prevailing winds in the above-named provinces are northwesterly in the cold season, the main branch of the Kuroshiwo has little influence on the climate of Japan. The westernmost branch of the Kuroshiwo passes thru the Strait of Corea, and northward along the western coast of Japan. Since the winds over the Sea of Japan are northwesterly in the cold season, the influence of this warm current along shore is to diminish the rigors of winter and greatly increase the precipitation. Two cold currents modify the temperature in their respective paths. The first of these issues from the Sea of Okhotsk, for the greater part of the time icebound, and passes southward between Sakhalin and the Siberian coast, and thence along

[1] It has been impracticable to reprint Professor Henry's tables Nos. 1-7, compiled for the use of the Bureau of Plant Industry, where they may be consulted.—*C. A.*

the coast of Corea. This current is effective in lowering the air temperature over the Sea of Japan. The second cold current, known in Japan as Oyashiwo, flows southwesterly from Kamchatka and impinges upon the east and south coasts of Yezzo, finally reaching the eastern coast of Hondo. The influence of this cold current is to cause an excess of cloud and fog and a lowering of the temperature, especially in summer on the Pacific slope of the districts mentioned.

Since the north and south extent of Japan is nearly equal to that of the United States; and since the general surface contour is much broken by mountain ranges the range of temperature is very great. In the Riu Kiu Islands a tropical climate prevails. In Kiushiu the monthly mean temperatures are somewhat similar to those of low altitudes in the Carolinas and Georgia. In Yezzo the climate, so far as temperature is concerned, approaches closely to that of southern New England, except that the maximum temperatures of summer are generally five or six degrees less than are experienced in corresponding latitudes. The minimum temperatures of winter are higher—as much as twenty degrees in some cases—than those experienced in the interior of the United States.

Maximum temperatures of 100°, or over, are rarely experienced in Japan, the highest maximum temperatures in the southern portion of the Empire range from 90° to 98° F. The lowest minimum in the interior of Yezzo rarely falls below 20° F. At Kagoshima, the latitude of which corresponds to that of Brunswick, Ga., the lowest temperature experienced in nine years was 21° above zero. In this country, it may be remembered, a minimum of 8° has been registered at Jacksonville, Fla. The reason for the greater equality of temperature in Japan than in the United States is found in its insular position.

Considering the monthly mean temperatures of the two countries, it will be found that for equal latitudes the winter temperatures in Japan are generally lower than in the United States, and that it is necessary, in order to find places in the United States having about the same monthly mean temperatures as in Japan, to pass several degrees to the north in the first-named country. If we take, for example, Tokyo, Japan, latitude 35° 41′ N., and seek the monthly mean temperatures on the corresponding latitude in the United States, we shall find that the winter temperatures in the United States are about 8° higher; spring 4° higher; summer 3° higher; and autumn 4° higher. (Compare Tokyo with Hatteras, N. C.) If, however, a point several degrees north of Hatteras be chosen, as for example, Solomons, Md., latitude 38° 19′ N., the difference will be much reduced. In Table 8 comparisons have been made between the monthly mean temperatures at four stations in Japan, and a number of stations in corresponding latitudes in the United States. The last station in each of the four groups was selected as the point whose monthly mean temperatures corresponded most closely to those of the Japanese stations. In the last group in the table, two stations have been given, one at Fayetteville, N. C., and the second at Visalia, Cal.

In general, while the temperature does not sink so low or rise quite so high in Japan as it does in corresponding latitudes in the United States, the mean temperatures, both for the months and the year, are several degrees lower in Japan than in this country. Chief among the principal causes of this difference is its insular position and the influence of cold northwesterly winds from eastern Siberia in winter, and the cooling produced by the flow of ocean currents which issue from the Sea of Okhotsk and the vicinity of the Kamchatkan Peninsula in summer.

A curious anomaly in the mean temperature of Japan is the fact that the highest mean temperature is reached generally in August, and this is also true of Vladivostock on the Siberian coast. Coincidentally with the occurrence of the highest mean temperature, there occurs also a minimum of cloudiness, as may be seen from the figures of Table 7. It is probable that the high mean temperatures of August may be due to the diminished cloudiness of that month.

Snow.—Snow falls in all parts of Japan except in the subtropical islands. In the interior of Yezzo the minimum temperature is below the freezing point thruout the winter months, and the precipitation is therefore almost wholly in the form of snow. This is also true in a greater or less degree of the slopes facing the Sea of Japan, where the atmospheric conditions are unusually favorable for almost continuous snow in the winter season. The region of maximum snow frequency, however, is in the island of Yezzo, where the average number of days for the year in the interior is about one hundred. The frequency diminishes thence toward the south, especially on the slopes facing the Pacific. At Kagoshima, which lies on the southern extremity of Kiushiu (lat. 32° N.) the average number of days with snow is but four. In latitude 32° N. in the United States snow falls only occasionally, except in elevated regions (600 feet and over).

Humidity.—The humidity, on account of the moisture supplied by the surrounding water surfaces, is rather high. See Table 6. The cloudiness is also greater than over purely continental areas. The conditions of snowfall, cloudiness, and humidity in the region of the Great Lakes is somewhat similar to that of western and extreme northern Japan.

THE CLIMATE OF EASTERN ASIA.

Eastern Asia is mostly composed of vast alluvial plains, separated by highlands, which in southern China rise probably 2,000 to 3,000 feet above sea-level. The general trend of the elevated regions of China and southern Siberia is from west to east, or northwest to southeast. Between the highlands vast river systems carry the drainage eastward to the Pacific. The highlands are not sufficiently extensive to greatly modify the distinguishing characteristics of the climate of northeastern Asia, viz, low temperatures in winter and high temperatures in summer. The winter in Siberia is the coldest experienced in the habitable portions of the globe and the range in mean temperature from winter to summer is remarkably large, thus the mean temperature of January at Nertchinsk is —21° F., that of July is 65° F., a range of 86°. Altho this is a very large range it does not represent the extreme values experienced in the region about Verkhoiansk, latitude 67° 34′ N., longitude 133° 51′ E., where Prof. H. Wild has recorded monthly means of —63.6° F. for January and 56.8° F. for July, being an annual range in mean temperature of 120.4°. For the sake of comparison it may be remarked that the annual range in monthly mean temperature in that part of the United States most resembling Siberia is about 65°. Spring begins in southern Siberia at the end of March when the noonday temperatures are on the average above freezing; vegetation does not appear, however, before the end of May. The transition from spring to summer is quite rapid. The summer is warm and often dry and therefore not conducive to the growth of corn and grass. All crops are sown or planted in the spring season.

In Manchuria the same general characteristics appear, viz, cold, dry winters, but with not quite so great a range in temperature; an early and short spring, a long and hot summer, with rains in July and August, and a short autumn, winter beginning in November.

Such observations as are available for Manchuria, about two years each at Mukden and Harbin, show the temperature conditions to be somewhat similar to those of the northern portions of the States of Wisconsin, Minnesota, and North Dakota.

The monthly mean temperatures of the northern provinces of China are represented in the accompanying table by two stations, Peking and Tai Yuen-Fu. While the winters are less rigorous than those of Mongolia on the north, represented by

a single station, viz, Urga, they are still colder than in corresponding latitudes in other countries; thus the winter mean temperature of Peking, latitude 39° 57′ N., is 27°, or about 7° lower than that of the eastern part of the United States, in the same latitude. In the western interior of the United States, say in northwestern Missouri and northwestern Kansas, the temperature conditions, as regards monthly means, are very similar to those of the province of Chi Li in which Peking is situated. The mean temperature, however, sinks to a much lower point at the Kansas and Missouri stations than at Peking, and the maximum temperatures of winter rise higher. In summer there is not much difference between the maximum temperatures of the two places, but the summer mean temperatures of our western plains are generally lower than those of the Chineses stations due to the difference in altitude. The rainfall distribution is also somewhat similar, altho the variability of the precipitation at Peking is greater than that of western Missouri.

The winter of the Yangtze Valley is almost 10° colder than in the corresponding latitudes of the United States. The summers are warm, in fact high temperatures prevail over interior China almost universally during the summer. The monthly mean temperatures in the Yangtze Valley find no exact counterpart in the United States. The winter temperatures approach rather closely to those found in northern Mississippi, northern Alabama, and northern Georgia, several degrees farther north than the Yangtze Valley and at about the same or probably less altitude on the average. The summer temperatures recorded in the Yangtze Valley are higher than for any point in the United States, except the southwestern regions. The mean temperatures of eastern Texas are about 2° to 4° lower than those of the Yangtze Valley stations, and these are the closest approach to the summer temperatures of the Yangtze Valley. The mean temperature of the central regions of China is shown by the tables.

Little is known of the upper Yangtze Valley and other portions of interior China except such information as can be gleaned from the reports of travelers. Herewith is presented an interesting note on the climate of the eastern part of the province of Sze-Chuen (La Geographie, Paris, Vol. XII, No. 2, 1905).

Altho the province of Sze-Chuen is situated between north latitudes 28° and 32°, the climate of the eastern portion, by reason of the mean altitude (500 to 1,000 meters—1,600 to 3,280 feet), should be classed as temperate. Altho the valley of the upper Yangtze from Ping-shan to Koui-tcheou (French spelling) is very warm and humid during six months of the year and forms a truly subtropical region, this is not true in the northern part of the province. At Cheng-tu-fu, for example, where I made observations for two years, the highest temperature recorded in summer was 37° C. (99° F.); this point, however, is rarely reached; the highest temperature generally oscillates between 30° and 33° C. (86° and 91° F.) The mean temperature from the 1st of June to the 1st of September was, in 1904, 24.9° C. (76.8° F.). The temperature during the day is high, but it regularly falls in the evening from 6° to 8° C. (11° to 14° F.) thus making it comfortable to sleep. The mean summer temperature of Cheng-tu-fu for the two years observations is 24.9° C. (76.8° F.); the mean of autumn, 16.3° C. (61.3° F.); the winter is not so severe. I have never seen the thermometer fall below —2° C. (28.4° F.). The mean registered in 1903 was 5° C. (41° F.), and in 1904, 6.9° C. (44.4° F.). The annual mean is 16° C. (60.8° F.).

The reasons for this remarkable equality in temperature in Sze-chuen are the mountain barrier on the north, which arrests the cold winter winds from Mongolia, and the Siberian plains; on the west and northwest the Sze-chuen Alps form a protection against the cold winds of higher altitudes.

A correspondent quoted by Hann "Handbuch der Klimatologie," III Band p. 237, says of the province of Sze-chuen:

The whole province is cloudy in winter. At Chung King on the Yangtsze-kiang nearly 2,400 miles from its mouth, according to Doctor Hirth, the winter is damp and cloudy; one does not see the sun for a week at a time. Summer, on the contrary, is clear and bright and very warm. The province of Yunnan, south of Sze-chuen, on the contrary, rejoices in a clear sky in winter, and it is to this fact that it received its name.

It is said of the climate of Chung King in the same province, latitude 29° 33′ N., longitude 107° 2′ E., that it has a very hot summer and a chilly winter: spring and autumn are lacking.

Precipitation.—The precipitation in eastern Siberia, Mongolia, Manchuria, and northern China is very scant in winter, but fairly abundant in June, July, and August. The rains seem to advance from the south since the months of heaviest rain in northern China are June and July, while in Manchuria they are July and August, and on the Siberian coast August and September.

The distribution of precipitation thruout the year in the above-named districts is quite similar to that which prevails over the western plains States of this country, with the exception that the maximum precipitation of the year occurs in June in the plains States rather than in July and August, as in the East. The annual amount diminishes generally from north to south and from the coast toward the interior. In northern China, say north of latitude 36° N., the average annual rainfall is probably between 25 and 30 inches. In Manchuria it is probably not over 20 inches in the southern portion, diminishing to about 16 inches in the northern portion of that province and the adjoining portions of Siberia.

The greater part of the precipitation north of latitude 36° N. comes in the warm season, and the total amount for the summer months, in an average season, is just about enough to satisfy the needs of agriculture.

The least precipitation ever recorded at Peking was 6.6 (?) inches in 1891, assuming that the printed record is correct; the next driest year was 1869, with a total of 9.5 inches. There is corroborative evidence of the correctness of the 1869 rainfall. The greatest rainfall in any one year was 42.7 inches in 1893, or 166 per cent of the annual mean from forty-two years' observations. The year of least precipitation gave only 26 per cent of the normal, an extraordinarily low value. In the United States, in general, the ratio of the driest year to the general mean is about 51 per cent for the whole country, and this value varies from as low as 16 per cent in the desert to as high as 75 per cent in the well-watered districts of the Atlantic coast. In those climatic regions in the United States which most resemble that of the province of Chi-li, in which Peking is situated, the ratio of the lowest annual amount to the general mean ranges from 50 to 75 per cent.

In southern and central China the annual average ranges from over 80 inches at Hongkong to about 40 inches in the Yang-tsze Valley, in the neighborhood of I-chang. The annual variations are not so great as in northern China.

Snow.—The amount of snow in southern Siberia and northern and central China is small. In the neighborhood of Peking it seldom remains unmelted on the ground for more than twenty-four hours. While light snow occasionally falls as far south as Canton, in the Yangtze Valley, the amount is insignificant. The number of days with snow on the average of the year is, for Peking, 11; for Shanghai, 6; and for Vladivostock, 16.

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TABLE 8.—*Comparative temperatures.*

MONTHLY MEANS.

The last station in each United States group represents the one approaching the foreign station most closely.

Latitudes and stations.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
	°	°	°	°	°	°	°	°	°	°	°	°	°
Latitude 41° 46′ N.:													
Hakodate, Japan	27	28	34	43	50	58	67	70	64	52	41	32	47
Same latitude in United States.													
Storrs, Conn.	24	24	36	46	56	64	69	68	61	50	38	30	47
Wauseon, Ohio	23	26	33	47	59	69	73	70	63	50	36	28	48
Newton, Iowa	20	20	35	50	62	70	75	72	64	53	36	22	48
Amherst, Mass.	24	25	34	46	57	66	70	68	62	50	38	27	47
Latitude 38° 14′ N.:													
Yamagata, Japan.	27	27	35	47	57	65	72	74	67	54	42	33	50
Same latitude in United States:													
Staunton, Va.	34	34	45	53	64	71	75	74	68	57	46	37	55
Louisville, Ky.	35	37	45	56	67	75	79	77	70	59	46	38	57
[1] Dover, N. J.	27	27	35	47	59	67	72	70	63	51	41	31	49
Latitude 35° 41′ N.:													
Tokyo, Japan	37	38	45	54	62	69	76	78	72	60	50	42	57
Same latitude in United States:													
Hatteras, N. C.	45	46	51	57	67	74	78	78	74	65	56	48	62
Goldsboro, N. C.	42	46	52	60	70	77	80	78	73	62	52	44	61
Santa Barbara, Cal.	53	55	55	58	60	63	65	67	66	63	59	56	60
[2] Solomons, Md.	35	35	44	53	65	74	79	78	72	60	49	39	57
Latitude 31° 35′ N.:													
Kagoshima, Japan	43	44	51	60	65	71	78	79	75	66	55	47	61
Same latitude in United States:													
Poulan, Ga.	48	51	59	64	73	79	81	81	76	66	57	50	65
Evergreen, Ala.	48	51	58	65	72	78	81	80	76	65	56	50	65
Alexandria, La.	49	50	59	67	74	79	82	82	76	66	57	50	66
[3] Fayetteville, N. C.	43	44	54	60	70	76	79	78	72	62	51	43	61
[4] Visalia, Cal.	44	49	52	58	66	74	80	79	71	63	52	45	61
Latitude 43° 9′ N.:													
Vladivostock, Russia.	−10	−4	9	27	39	54	62	61	51	35	14	−5	28
Same latitude in United States:													
Plymouth, N. H.	16	18	26	42	54	64	68	66	58	46	34	22	43
Port Huron, Mich.	22	23	30	43	54	64	69	65	62	50	37	27	46
Rosebud, N. Dak.	21	20	31	46	58	67	74	72	62	49	33	24	46
Bandon, Oreg.	45	45	47	50	53	57	58	58	56	52	49	47	51
[5] Morris, Minn.	8	10	24	45	56	66	71	68	60	46	26	15	41
Latitude 39° 57′ N.:													
Peking, China	24	30	41	57	68	76	79	76	68	54	39	28	53
Same lat tude in United States:													
Philadelphia, Pa.	32	34	40	51	62	72	76	74	68	57	45	36	54
Oregon, Mo.	23	28	38	53	64	72	75	75	67	55	40	28	52
Denver, Colo.	29	32	39	48	57	67	72	71	63	51	39	33	50
[6] Concordia, Kans.	26	28	39	55	63	73	78	76	68	56	41	32	53
Latitude 32° 22′ N.:													
Ho k'ien, China.	34	39	49	60	69	78	82	81	72	62	49	38	59
Same latitude in United States:													
Dudley, Ga.	47	48	59	65	75	81	82	82	77	66	57	48	66
Montgomery, Ala.	48	51	58	65	74	80	82	81	76	66	56	49	66
Abilene, Tex.	44	46	55	65	72	79	82	82	75	66	54	47	64
[7] Oklahoma, Okla.	37	37	49	61	68	76	80	80	73	62	49	40	59
Latitude 30° 52′ N.:													
I-chang, China.	42	43	52	64	72	80	84	86	76	66	56	46	64
Nearest latitudes in U. S.: [8]													
Fredericksburg, Tex.	49	51	58	66	72	78	81	80	75	66	55	50	65
Tallahassee, Fla.	52	55	60	67	75	79	80	80	77	68	59	53	67
Melville, La.	51	53	61	68	75	79	82	81	77	67	59	52	67

[1] Latitude 40° 50′ N.
[2] Latitude 38° 19′ N.
[3] Latitude 35° 6′ N. } Both stations resemble
[4] Latitude 36° 20′ N. } Kagoshima.
[5] Latitude 45° 30′ N.
[6] Latitude 39° 35′ N.
[7] Latitude 35° 26′ N.
[8] No station in United States corresponds closely with I-chang.

TABLE 9.—*Comparative lowest minimum temperatures.*

Stations.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
	°	°	°	°	°	°	°	°	°	°	°	°	°
Hakodate, Japan													−7
Storrs, Conn.	−13	−13	2	15	25	39	45	42	32	20	5	−9	−13
Wauseon, Ohio.	−32	−24	−17	5	21	34	41	38	25	12	−8	−32	−32
Newton, Iowa.	−27	−28	−6	15	28	41	50	43	22	15	−8	−22	−28
Amherst, Mass.	−22	−19	−6	16	24	34	40	37	28	20	4	−15	−22
Yamagata, Japan.													−4
Staunton, Va.	−13	−12	4	19	31	41	48	47	32	20	10	−3	−13
Louisville, Ky.	−20	−14	3	21	33	44	54	50	36	26	4	−7	−20
Dover, N. J.	−13	−10	−4	14	28	40	43	40	30	19	8	−6	−13
Tokyo, Japan.													15
Hatteras, N. C.	14	11	25	31	43	56	61	60	50	42	27	8	8
Goldsboro, N. C.	12	11	17	30	36	46	50	53	41	31	17	9	9
Santa Barbara, Cal.	28	29	34	38	40	46	48	52	49	47	40	32	28
Solomons, Md.	4	−5	15	28	41	52	57	58	46	35	20	10	−5

TABLE 9.—*Comparative lowest minimum temperatures*—Cont'd.

Stations.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
	°	°	°	°	°	°	°	°	°	°	°	°	°
Kagoshima, Japan													21
Poulan, Ga.	10	−1	19	27	41	49	56	58	40	32	21	11	−1
Evergreen, Ala.	13	0	23	30	42	54	59	59	40	30	22	13	0
Alexandria, La.	17	2	20	29	40	45	59	48	40	28	19	10	2
Fayetteville, N. C.	10	−5	15	29	42	51	54	51	39	30	16	9	−5
Visalia, Cal.	17	21	22	30	35	38	45	49	37	31	23	19	17
Peking, China	−2	−4	12	26	39	47	62	58	43	28	8	3	−4
Philadelphia, Pa.	−5	−6	5	18	36	47	54	51	40	31	8	−5	−6
Oregon, Mo.	−30	−26	−12	8	26	41	47	37	25	8	−10	−24	−30
Denver, Colo.	−29	−22	−11	4	27	36	42	43	27	1	−18	−25	−29
Concordia, Kans.	−25	−25	−2	18	27	43	46	41	29	20	−15	−10	−25
I-chang, China	20	22	28	39	43	60	60	67	58	45	33	26	20
Tallahassee, Fla.	19	−2	25	38	45	54	57	61	52	35	27	12	−2
Melville, La.	16	5	25	38	45	51	61	54	42	32	21	10	5
Fredericksburg, Tex.	11	−1	19	32	38	48	59	57	43	28	24	11	−1

TABLE 10.—*Mean number of days with minimum temperature below 32° F.*

Stations.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
Sapporo	31.0	27.8	27.3	13.7	2.7	.....	.....	.....	.....	5.0	18.5	28.5	154.5
Hakodate	29.9	25.5	23.4	8.4	0.9	.....	.....	.....	.....	1.7	13.4	25.8	129.0
Akita	30.0	27.0	24.0	3.0	.....	.....	.....	.....	.....	.....	7.0	23.0	114.0
Yamagata	30.0	26.0	17.5	4.5	.....	.....	.....	.....	.....	0.3	10.3	22.7	111.3
Matsumoto	30	27	23	7	1	.....	.....	.....	.....	1	15	26	130
Tokyo	25.6	19.2	9.5	0.6	.....	.....	.....	.....	.....	0.1	1.4	15.9	72.3
Gifu	24.4	20.8	11.8	0.7	.....	.....	.....	.....	.....	.....	2.3	12.0	71.5
Wakayama	13.8	11.5	4.4	0.2	.....	.....	.....	.....	.....	.....	0.1	4.2	34.2
Hiroshima	18.8	13.8	6.8	0.2	.....	.....	.....	.....	.....	.....	0.8	8.2	41.0
Kagoshima	9.4	7.2	1.2	.....	.....	.....	.....	.....	.....	.....	0.1	3.6	21.5

Mean number of days with maximum temperatures above 86° F.

Sapporo	.....	.....	.....	.....	.....	0.2	3.2	5.7	0.3	.....	.....	.....	9.4
Hakodate	.....	.....	.....	.....	.....	.....	0.8	1.9	0.1	.....	.....	.....	2.8
Akita	.....	.....	.....	.....	.....	.....	2.0	5.0	11.0	2.0	.....	.....	20.0
Yamagata	.....	.....	.....	.....	.....	1.0	2.5	5.3	10.7	3.0	.....	.....	22.5
Matsumoto (77° or above)	.....	.....	.....	1	7	13	22	28	15	1	.....	.....	85
Tokyo	.....	.....	.....	.....	.....	0.7	9.9	16.0	4.2	.....	.....	.....	30.8
Gifu	.....	.....	.....	.....	0.6	2.3	15.7	24.3	7.6	.....	.....	.....	50.5
Wakayama	.....	.....	.....	.....	0.1	0.9	15.6	25.2	8.5	.....	.....	.....	33.4
Hiroshima	.....	.....	.....	.....	.....	0.4	15.2	24.7	7.8	.....	.....	.....	48.1
Kagoshima	.....	.....	.....	.....	.....	2.0	20.0	24.0	11.2	0.1	.....	.....	57.4

Extreme dates of first and last occurrence of minimum temperatures below 32° F.

Stations.	First date.	Last date.	Stations.	First date.	Last date.
Sapporo	Oct. 8	May 20	Gifu	Nov. 12	Apr. 10
Hakodate	Oct. 11	May 28	Wakayama	Nov. 30	Apr. 4
Akita	Oct. 26	Apr. 30	Hiroshima	Nov. 13	Apr. 8
Yamagata	Oct. 31	Apr. 27	Kagoshima	Nov. 29	Mar. 23
Tokyo	Oct. 31	Apr. 15			

TABLE 11.—*Mean dates of the occurrence of a minimum temperature of 32° F. in Japan.*

Stations.	First date.	Dast date.	Stations.	First date.	Dast date.
Yezzo.			*Hondo.*—Cont'd.		
Sapporo	Oct. 18	May 7	Tokyo	Nov. 28	Mar. 27
Hakodate	Oct. 26	Apr. 30	Gifu	Nov. 27	Mar. 30
Hondo.			Wakayama	Dec. 17	Mar. 23
Akita	Nov. 7	Apr. 14	Kagoshima	Dec. 15	Mar. 8
Yamagata	Nov. 6	Apr. 12			

NOTES FROM THE WEATHER BUREAU LIBRARY.

By C. FITZHUGH TALMAN, Librarian.

A PILOT-BALLOON STATION AT AACHEN.

It is announced in Illustrierte Aeronautische Mitteilungen that a pilot-balloon station has been established at Aachen (Aix-la-Chapelle) in connection with the meteorological observatory and Public Weather Service center at that place, of which Dr. P. Polis is director. The new institution is maintained at the expense of the German Empire, and has been in